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PATENT INFRINGEMENT AND REASONABLE ALLOWANCE OF NEW TECHNOLOGIES IN CLAIM CONSTRUCTION*

Chung-Lun Shen**

ABSTRACT

Traditionally, the development of case law and judicial cases focused on whether the determination of patent infringement would interfere with the status of prior art in various jurisdictions. The claim construction is often made according to the characteristics of an invention as distinct from prior art to avoid the determination of literal infringement in order to bring prior art into the scope of exclusive rights admitted by patent law. The defense of prior art is also recognized against the application of the doctrine of equivalents for the same purpose. However, no similar mechanism exists under the determination of patent infringement to deal with the practice of after-arising technologies by the infringer. In other words, a dispute arises when the accuser takes advantage of technologies to infringe upon the patent, which is not seen at the application date of the above-mentioned patent. If the after-arising technologies are unconditionally dominated by the patentee through the assertion of literal infringement or the application of the doctrine of equivalents, the risk of overcompensation to the patentee is possible, which results in opportunities to hinder the policy of technological improvement and cumulated innovation under patent law. However, if it is undeniable that the after-arising technologies are not completely foreseen by the patentee, failure to include these technologies in the claim of a patent should not be at-

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tributable to the patentee. This article probes the reasonable allowance of after-arising technologies in the determination of patent infringement. After reviewing the past approaches proposed to resolve the issue of after-arising technologies and patent infringement, this article concludes that the analogous application of the non-obviousness requirement to evaluate after-arising technologies is an optimal model to balance the conflicting interests between the adequate protection of the patentee and the public interest, which would lead to fostering technological improvement and cumulated innovation.

I. INTRODUCTION

Distinguished from traditional tangible properties, patents must rely upon their claim and specification to provide a public notice about the scope of exclusive rights.¹ Because the determination of patent infringement is subject to the violation of exclusive rights,² the claims of a patent play a key role in deciding the acts that constitute patent infringement. Generally, there are two types of tests under patent law for the determination of patent infringement: (1) the literal infringement test and (2) the doctrine of equiv-

¹ See Timothy R. Holbrook, *Patents, Presumptions, and Public Notice*, 86 IND. L.J. 779, 789-91 (2011). See also Article 69(1) of the European Patent Convention: "The extent of the protection conferred by a European patent or a European patent application shall be determined by the claims. Nevertheless, the description and drawings shall be used to interpret the claims." There are similar provisions in Article 58 of Taiwanese Patent Act and Article 59 of Chinese Patent Act.

² See Article 28 (1) of Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods ("the TRIPS Agreement"): "A patent shall confer on its owner the following exclusive rights: (a) where the subject matter of a patent is a product, to prevent third parties not having the owner's consent from the acts of: making, using, offering for sale, selling, or importing for these purposes that product; (b) where the subject matter of a patent is a process, to prevent third parties not having the owner's consent from the act of using the process, and from the acts of: using, offering for sale, selling, or importing for these purposes at least the product obtained directly by that process." See also 35 U.S.C. § 154(a)(1); ALEXANDER HARGUTH & STEVEN CARLSON, *PATENTS IN GERMANY AND EUROPE—PROCUREMENT, ENFORCEMENT AND DEFENSE—AN INTERNATIONAL HANDBOOK* 186 (2011)(citing Article 9(1) of German Patent Act); Article 58of Taiwanese Patent Act; Article 11 of Chinese Patent Act.

alents (“DOE”). The former focuses upon the claims of a patent to determine whether the accused product or method was element-by-element read into any claim,³ whereas the latter secures the fairness of patent protection by evaluating patent infringement where the accused product or method was made through insubstantial improvement about the patent.⁴ According to patent law, the time for the determination of literal infringement is set on the date of the patent application. However, a patent infringement usually occurs *after* a patent is issued. When the infringer took advantage of new technologies arising after the date of the patent application, it is worth considering whether such technologies would break the public notice of a patent and endow the patentee with an inadequate stretch of the patent.⁵ Similarly, the doctrine of equivalents also concerns the issue of new technology, especially on the ground that it is applied in accordance with the time of patent infringement.⁶ This article discusses the effect of new technologies

³ See F. Scott Kieff et al., *Principles of Patent Law—Cases and Materials*, 819 (5th ed. 2011); HARGUTH & CARLSON, *supra* note 2, at 182-83; DOUGLAS CLARK, *PATENT LITIGATION IN CHINA* 122-25 (2011).

⁴ As a matter of fact, the term of “the doctrine of equivalents” is usually used in U.S. patent case law. However, a similar function of the doctrine may be found in various jurisdictions. See *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 36, 39-40 (1997) (the U.S. representative case); HARGUTH & CARLSON, *supra* note 2, at 183-85 (the authors organized the four elements adopted German Supreme Court to evaluate the equivalent infringement); *T.H.K. Co. v. Tsubakimoto Seiko Co.*, Case No. Heisei 6(o) 10831, Case No. Heisei 6(o) 1083, Supreme Court of Japan (Saikou Saibansho), February 24, 1998, in PAUL GOLDSTEIN, *INTERNATIONAL INTELLECTUAL PROPERTY LAW-CASES AND MATERIALS* 478-483 (2nd. ed. 2008) (translated by Toshiko Takenaka) (the Japanese representative case); *Kirin-Amgen v. Hoechst Marion Roussel*, [2004] UKHL 46, [2005] 1 All ER 667, [2005] RPC 9, at ¶ 47-48 (U.K. adopted “the purposive construction” to achieve the same goal of the doctrine of equivalents.); CLARK, *supra* note 3, at 125-28.

⁵ On the academic literature in the issue of “after-arising technologies” or “later-developed technologies”, see, e.g., Kevin Emerson Collins, *The Reach of Literal Claim Scope into After-Arising Technology: On Thing Construction and the Meaning of Meaning*, 41 CONN. L. REV. 493, 497 (2008).

⁶ *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. at 37. Perhaps other jurisdictions are not always to determine an equivalent infringement. However, when the infringement involves the issue of after-arising technologies, they unavoidably will face a similar issue if such technologies lead to overcompensation over the patentee and hinder simultaneously improvement and cumulative innovation in relevant technologies.

on the determination of patent infringement in order to ensure that the determination of patent infringement is justified in meeting the jurisprudence of patent law and to prevent the patentee from being overprotected. Another significant issue is to detect the reasonable allowance for the incorporation of new technologies into the determination of patent infringement under a literal infringement test and the doctrine of equivalents.

This article relies mainly on a theoretical construction to justify the analogous concept of the non-obviousness requirement under patent law to ascertain the reasonable allowance of after-arising technologies on the determination of patent infringement. Some approaches that may be used to deal with the issue of after-arising technologies are reviewed in accordance with the rationale of patent law. This article proposes the refinement of two ways to strengthen the position on the issue of after-arising technologies. One is to provide the theoretical ground of the proposed model for the resolution of disputes of after-arising technologies. The second is to attempt to make the model workable in various jurisdictions.

The issue of after-arising technologies under patent infringement is rarely a main concern of judicial decisions. The issue of after-arising technologies has not been popular under patent law; not because it has been ignored, but because an ideal model for deciding the issue has not been put forward. Consequently, in some cases, the courts choose to resolve the issue through claim construction or the application of DOE instead of positively proposing a legal ground to avoid the absolute interference of exclusive rights in after-arising technologies and without stating a theory to support its position. This article hopes the proposed model could deliver a justified base under patent law for reference in the future development of case law or in judicial cases on the issue of after-arising technologies under patent infringement.

II. PATENT INFRINGEMENT AND REASONABLE ALLOWANCE OF AFTER-ARISING TECHNOLOGIES.

A. Predicament of Literal Infringement and Doctrine of Equivalents

Under patent laws in various jurisdictions, patent infringement is determined through the practice of claims or the doctrine of equivalents. On one hand, without the patentee's authorization, practicing claims to materialize the abstract technologies contained in the claims—for the purpose of the manufacture of patented products or the execution of patented process—constitutes literal infringement under patent law. On the other hand, even if the infringer did not practice any claim completely, having changed one or more elements of the claim, such partial materialization may still be evaluated as an infringement on the condition that the changes reflected in the accused product or process, compared with the original elements of the claim, never led to a substantial difference under the observation of a person having ordinary skill in the art (“PHOSITA”). That is, judicially-developed, the doctrine of equivalents (hereinafter “DOE”)⁷. In spite of the shared function of both literal and equivalents to secure patent exclusive rights, the jurisprudences behind the two infringements are very distinct. Moreover, the two infringements also have deficiency in the determination of infringement, which could possibly run against the gist of patent law, thus motivating the improvement and cumulative innovation of technologies.

Patents are intangible properties. Patent claims serve as public notice to demarcate the boundary of the exclusive rights enjoyed by the patentee. The patent's specification is read to clarify ambiguous parts of claims for the interpretation of the width of a patent. Under the peripheral system, as in U.S. patent law, in alerting the prohibition of an absolute importation of the specification into the interpretation of claims, case law has not denied the function of the

⁷ See Toshiko Takenaka, *Extent of patent protection in the United States, Germany, the United Kingdom and Japan: examination through the concept of 'person having ordinary skill in the art of the invention'* in PATENT LAW AND THEORY--A HANDBOOK OF CONTEMPORARY RESEARCH 450-61 (2008).

specification for ascertaining the inventor's real intention in drafting the claims for the patent application.⁸ Furthermore, to be self-evident under an eclectic system, as in Europe, Taiwan, and China, the affirmation that the specification is among the most significant sources for the construction of claims is codified.⁹ Consequently, when claims work with the specification to deliver information about a patent, the public theoretically should grasp the scope of the patent as well as the extent to which the claims might be reduced into practice. In this point, the achievement of public notice of a patent seems to justify the patentee to take advantage of the literal infringement to seek remedies against third parties' practicing patent claims without authorization¹⁰.

However, in reality, claim construction is awkward because the ultimate purpose of such construction is to probe the intention of the inventor in designing the claim. The plain and reasonable interpretation of a claim is not made by referring to an ordinary or technical dictionary that the public can easily access to ascertain a common meaning of any element in the claim without bearing ex-

⁸ See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (*en banc*) (U.S.). U.K. patent also complies with the peripheral system for claim construction. See WILLIAM CORNISH & DAVID LLEWELYN, *INTELLECTUAL PROPERTY: PATENTS, COPYRIGHTS, TRADE MARKS AND ALLIED RIGHTS* § 6-02 (5th ed. 2003); See MARTIN ADELMAN ET AL., *GLOBAL ISSUES IN PATENT LAW* 183-84 (2011) (*Kirin Amgen Inc. v. Hecolst Marion Roussel Ltd.*, House of Lords, [2004] UKHL 46, at § 20.).

⁹ Traditionally, the German patent law had adopted the central definition system to determine the most adequate scope for a claim through claim construction conducted by the court, which is possibly broader than what was granted as a patent at the beginning. In other words, the courts have the authority to build up the patent right's scope based upon the initial grant of the patent in accordance with the real development of objective circumstances. However, in order to strengthen the public notice about the patent, it is a popular tendency to follow the eclectic system in Europe, reflected in Article 69(1) of the European Patent Convention. See MARTIN ADELMAN ET AL., *GLOBAL ISSUES IN PATENT LAW* 183-84 (*Kirin Amgen Inc. v. Hecolst Marion Roussel Ltd.*, House of Lords, [2004] UKHL 46, at § 22.). See also Article 58 of Taiwanese Patent Act; Article 59 of Chinese Patent Act. On the past experience and evolution of U.S. patent about the central definition system, Charles W. Adams, *The Doctrine of Equivalents: Becoming a Derelict on the Waters of Patent Law*, 84 NEB. L. REV. 1113, 1116-20 (2006).

¹⁰ See Timothy R. Holbrook, *Patents, Presumptions, and Public Notice*, 86 IND. L.J. 779, 789 (2011).

tra costs, but the inventor's own lexicography.¹¹ Under patent law, to respect the meaning of a claim intended by the inventor, intrinsic evidence is prioritized over extrinsic evidence for claim construction when any ambiguity exists regarding the element of a claim read between the patentee and third parties.¹² Only on occasions where the intrinsic evidence cannot resolve the conflicting interpretations of a claim, can extrinsic evidence be justified in coming into play in claim construction. According to the experience of various jurisdictions on patent law, it seems that the use of intrinsic evidence has not worked as efficiently as the public anticipated in exploring the real intention of the inventor regarding what the elements of the claim should be. It is well known the specification is a significant source of intrinsic evidence. However, instead of settling disputes on claim construction, the specification often causes uncertainty of interpretation due to the interplay between a claim and its specification.¹³ Although the importation of examples to fix the interpretation of the scope of a claim in the specification is prohibited, in some cases, the specification may serve as a limitation. In other cases, the specification is allowed in a claim that meets the real intention of the inventor.¹⁴ Consequently, without definite guidelines, the correlation between a claim and its specification obfuscates the distinction of occasions where the specification may be the limitation of a claim from those where the interpretation of a claim may break through the specification. From this point, the public seems to bear more costs in recognizing the public notice of a claim because a claim could not directly convey its reasonable scope by its wording. Such phenomena substantially hinder the function of public notice of a claim, and further affect the justification of the assertion of patent literal infringement. Aside from the weak public notice of a claim because of the difficulty in setting up a clear standard for claim construc-

¹¹ Phillips v. AWH Corp., 415 F.3d at 1316.

¹² Phillips v. AWH Corp., 415 F.3d at 1320-22. Generally speaking, the intrinsic evidence includes the claim wording, the specification, and prosecution history, the extrinsic evidence contains the dictionaries, the expert testimony, and technical treatises.

¹³ See Craig Allen Nard, *A Theory of Claim Interpretation*, 14 HARV. J. LAW & TEC 2, 7-9 (2000).

¹⁴ See Peter Menell et al., *Patent Claim Construction: A Modern Synthesis and Structured Framework*, 25 BERKELEY TECH. L.J. 711, 746-748 (2010).

tion, claim construction also faces the predicament where the determination of literal infringement would contradict the gist of patent law, which always prevents the possession of prior art from the patentee and secures technological improvement and cumulative innovation.¹⁵

The determination of literal infringement under patent law is made through the comparison of the accused product and the claim to ensure all elements of the accused products are read into the claim on a corresponding basis. If a claim is mechanically interpreted to include the elements of the accused products without checking the capacity allowable under patent law, the patentee will be given a chance to take advantage of prior art or after-arising technologies to detect excessive interests that the patent law finds unbearable. Under this situation, the overcompensation through literal infringement surely will collapse the interest balance between the patentee and the public, as well as the sound evaluation of patent practice established by the patent law system.

For example, under a hypothetical scenario, we assume that Claim 1 of Patent A is about an article, composed of Element X1, Element Y, and Element Z. Each accused product made and sold could be divided into Element X2, Element Y, and Element Z. The accused product is read in the aforesaid Claim 1 because Element X1 goes through claim construction to cover Element X2. In other words, the manufacture and sale of the accused products constitute the literal infringement of Claim 1 of Patent A. However, it can be proven that the technology for making the accused product had been available prior to the application date of Patent A. It means

¹⁵ In order to determine a literal infringement, prior art is often used to distinguish the claim to conclude an accurate claim interpretation. Moreover, the defense against patent infringement about the patent invalidity caused by the loss of novelty also proves that the exercises of exclusive rights under patent law should be off the scope of prior art. Certainly, the prior art limitation for the application of DOE has been admitted in the various jurisdictions. See MENELL, *id* at 723; DONALD CHISUM, 5B-18 CHISUM ON PATENTS § 18.04 [2] (2012) (LexisNexis); *Wilson Sporting Goods Co. v. David Geoffrey & Assocs.*, 904 F.2d 677 (Fed. Cir. 1990); Mario Franzosi, *Equivalent in Europe*, E.I.P.R., 2003, 25(6), 238; Are Stenvik, *Protection of Equivalents under Patent Law—Theories and Practice*, 32 IIC 1, 12-13 (2001); *T.H.K. Co. v. Tsubakimoto Seiko Co.*, *supra* note 4, at 481.

that the manufacture and sale of the accused product had already been serving as prior art for Patent A, according to patent law. It is supposed that such prior art would not affect the patentability of Patent A. It may be observed from case law that the determination of literal infringement lacks a special mechanism to detect if prior art would be incorporated in claim construction. While the manufacture and sale of accused products are evaluated as a literal infringement, it is easy to bring the technology positioned as prior art directly into the possession of the patentee over Claim 1 of Patent A. Certainly, it is not deniable that claim construction could potentially fine-tune the patent to preclude prior art from going within any claim of a patent. However, such effect would be the result of extra manipulation through specially considering prior art instead of the necessary function inherent in the application to determine literal infringement.

We also set a scenario for after-arising technologies. The infringer made and sold the accused product, which comprises Element X3, Element Y, and Element Z in the market. It is assumed that Element X3 was not developed until the infringement date of Patent A. However, Element X3 is interpreted as within the definition of Element X1 of Claim 1 of Patent A, according to claim construction. Consequently, when the manufacture and sale of the accused products constituted the literal infringement against Claim 1 of the patent, the patentee simultaneously includes Element X3 as part of Claim 1 for the exercise of exclusive rights under patent law. Because there was no opportunity to fix the wording related to Element X3 in Claim 1 at the time of the application date, it may be reasonably inferred that Element X3 was never prosecuted with Element Y and that Element Z, as a whole, secures the patent eligibility and patentability. Under this scenario, it is worth further questioning to determine, if Element X3 were not prosecuted, if Element X3 is justified in becoming the subject matter over which the patentee could exercise exclusive rights.

Comparatively, the function of DOE under patent law merely concentrates on the ground of fair protection for the patentee. Also, DOE works to prevent the infringer from escaping unreasonably the liability caused by the literal infringement merely by making insubstantial changes to Claim 1 for the manufacture and sale of the accused products. In addition, it is commonly thought that

the critical date for the application of DOE is not established at the application date of patent, but rather at the time when the infringement occurred. Compared with literal infringement, the scenarios mentioned above seem to happen in the application of DOE. We assume that the accused product contains Element X4, Element Y, and Element Z. Although Element X4 is out of the scope of Element X1, in this scenario, based upon an insubstantial change from Element X1 to Element X4, the manufacture and sale of the accused products are still evaluated as an infringement on Claim 1 of Patent A. As the determination of literal infringement does, DOE possibly leads to an extension of Claim 1 to subsume Element X4 as part of the scope of exclusive rights. However, the technology used to make the accused product existed before the application date of Patent A. In fact, the accused products are positioned as prior art of Patent A. In another scenario, if Element X4 is developed after the application date of Patent A, the application of DOE also determines the accused products as a patent infringement, even though the accused products never existed in the marketplace at the application date of Patent A.

B. Novelty and Patent Infringement

Prior art has played a core role in determining the patentability of an invention under patent law. An invention may be transferred to a patent if it can be conceived to transcend the technological status set up by prior art. Not only does the patentability make an invention distinguished from other relevant and analogous technologies existing at the date of patent application through specific elements or limitations, but it also secures the advance of an invention over the current technological development, according to the evaluation of a PHOSITA when a patent application is filed. The former is the requirement of novelty under patent law.¹⁶ On the one hand, the novelty requirement encourages new inventions under patent law to correspond to the continuing demand of industries for technologies. The legislative purpose of the novelty requirement is declared in various jurisdictions to emphasize that the

¹⁶ See 35 U.S.C. § 102 (2011) (U.S. Patent Act); Article 54(2) of the European Patent Convention; Article 23 of Taiwanese Patent Act; Article 22 of Chinese Patent Act.

patent system is established to promote the technological developments of industries through the innovation of new things.¹⁷ Any possible innovation derives from new things or new uses of old things.¹⁸ It cannot be imagined that an invention containing old things would be granted as a patent to exclude the public from accessing the invention. Without technological contributions, it is hard to claim a patent for an invention that merely reorganizes old things. On the other hand, from the angle of the limitation of exclusive rights, novelty is justified because it protects the public from being deprived of the benefits already contributed by prior art.¹⁹ The significant meaning of innovation is to create a new status, in which the inventions exist to produce more technological benefits shared by the public than the ordinary things did under an old status. The new status should be evaluated prospectively and dynamically, while the old status remains steady and static. Moreover, the new status always parallels the old one without interference.²⁰ Anything transposed directly from the old status never establishes a new status.²¹ Theoretically, under the element–element

¹⁷ See DONALD CHISUM, 5B-18 CHISUM ON PATENTS § 3.01(2013) (LexisNexis).

¹⁸ Even according to the continental law system, the method for treatment of the human is always as an exception of patentability, but the substance or composition used in such treatment may be considered patentable on the condition that its use is new. See Article 54(4)&(5) of the European Patent Convention.

¹⁹ See Dan L. Burk & Mark A. Lemley, *Inherency*, 47 WM AND MARY L. REV. 371, 374, 379-84 (2005).

²⁰ As this article addressed, the new technological status encouraged by patent law is never expected to subsume the technologies within prior art. Claim construction to exclude literal infringement from prior art and the prior art defense against DOE are both strong proof.

²¹ On determination of novelty, the strict identity rule and the inherent doctrine are implemented to ensure that the invention is anticipated by known prior art. The strict identity rule focuses on the comparison between the invention and a single document as prior art. Any element of the invention read into the document as prior art leads to loss of novelty of the invention under patent law. Even though the difference resulting from the aforesaid comparison is presented, the inventor still suffers from novelty as long as the difference would be recognized by PHOSITA or enabled by the document as prior art. That is the inherency doctrine. See Janice M. Mueller & Donald S. Chisum, *Enabling Patent Law's Inherent Anticipation Doctrine*, 45 HOUS. L. REV. 1101, 1108-11 (2008); RICHARD HACON & JOCHEN PAGENBERG, CONCISE EUROPEAN PATENT LAW 42-44 (2d ed. 2008) ; HARGUTH & CARLSON, *supra* note 2, at § 2.51. The critique was made to question that the application of the inherent doctrine has substantially

comparison for the determination of literal infringement, it is possible to read the prior art into a claim of a patent through claim construction, provided that the accused product or process was made or practiced based on technologies defined within the prior art of the patent. However, this result contradicts the legislative policy of the requirement of novelty under patent law and makes no difference in entitling the patentee to take possession of benefits already enjoyed by the public before the patent application, instead of the harvest resulting from any innovation. By the same token, the application of DOE also runs into the above-mentioned predicament by subsuming prior art to determine patent infringement. Consequently, the prior art of a patent cautions us that a legal boundary derived from the prior art always includes claim construction and the application of DOE to determine the patent infringement.²²

C. Non-obviousness and Patent Infringement

Compared with the requirement of novelty under patent law, non-obviousness is required to ensure that an invention moves beyond prior art in an inventive quality in order to be granted a patent, even if the invention was made to meet the requirement of novelty. When an invention is evaluated with reference to prior art, the inventive quality beyond prior art does not merely show in technological difference and improvement. Further, the requirement of non-obviousness relies more attention upon whether such the difference or improvement is a necessary development, in

blurred the line between the determination of novelty and the evaluation of non-obviousness. See Sean B. Seymore, *Rethinking Novelty in Patent Law*, 60 DUKE L.J. 919, 954-55 (2011).

²² Professor Lemley proposed the concept of novelty, pointing to the need to review some significant and systematical issues under U.S. patent law and thinking that the point-of-novelty is conducive to achieving the goal of promoting innovation. In the limited meaning of my argument, the concept of novelty point actually indicates a further idea on the symmetry of novelty over the contribution of an invention. Hence, novelty might serve as a signal for the patentee to be wary of the reasonable scope of exclusive rights endowed by patent law. Anything outside novelty will be seriously scrutinized to ascertain if prior art is preempted by literal infringement or DOE. On the concept of novelty point, see Mark A. Lemley, *Point of Novelty*, 105 NW. U. L. REV. 1253, 1274-75 (2011).

terms of PHOSITA, achieved by the teaching, suggestion, and motivation of prior art, which combines with the fundamental knowledge of PHOSITA and other objective circumstances, such as customer demands in the market.²³ If the affirmative answer is confirmed, the invention fails to satisfy the requirement of non-obviousness.

The requirement of non-obviousness has two significant meanings, both of which relate to the legislative policy on patent law. First, an invention that was conceived merely by following the path driven by prior art recognized by a PHOSITA makes it impossible to implement the innovation policy inherent in patent law.²⁴ If this invention were qualified as a patent, the access of the

²³ Non-obviousness, among patentable requirements, is named by the U.S. patent law system, and derives from the approach of difference evaluation admitted by Article 103 of U.S. Patent Act. 35 U.S.C. 103 (2011) states: "A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made." Although Article 103 was amended in 2011, the amendment merely reflects the system's shift from "First to Invent" to "First inventor to file" (similar to the "First to file" system under most jurisdictions). The most significant meaning of the amendment to Article 103 is presented in the critical data to evaluate the requirement of non-obviousness set at the patent application, other than at the invention conceived. No strong evidence has shown changes in related doctrines or principles about the evaluation of non-obviousness. The representative case in modern U.S. patent law, please see *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 419-22 (2007). As to the development of European patent law, the approach of problem solving has been traditionally adopted to evaluate the requirement of "Inventive Step" (similar to the concept of non-obviousness). See Under this approach, there are three main steps: (1) determining the closest prior art; (2) establishing the objective technical problem to be solved; (3) considering whether or not the claimed invention, starting from the closest prior art and the objective technical problem, would have been obvious to the skilled person. Please see Adelman, *supra* note 8, at 130-137 (Excerpting *Actavis UK Limited v. Novartis AG* case. See also *HACON & PAGENBERG*, *supra* note 21, at 53-55. The authority of non-obviousness or inventive step under the European Patent Convention is Article 56, stating: "An Invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art...."). See also Article 22 of Taiwanese Patent Act and Article 22 of Chinese Patent Act.

²⁴ *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. at 421 ("When there is a design need

public to ordinary logics and knowledge derived from prior art would be blocked. Such patents also would frustrate the technological improvement and further innovation of prior art.²⁵ In this situation, the patentee would be given the opportunity to occupy the benefits contributed by prior art. Simultaneously, through the exclusive rights endowed by patent law, the patentee might strengthen its control over other inventions, which were derived from prior art within the range of prior art's inventive quality. Second, since the requirement of non-obviousness indicates the inventive quality of a patent, it may be used as a basis to recognize the extent to which a patented invention exceeds prior art in light of the evaluation of a PHOSITA.²⁶ Excellency of inventive quality over prior art contributed by the patentee is justified to support the assertion of exclusive rights enjoyed by the patentee under patent law.²⁷ In other words, the benefits resulting from the requirement of non-obviousness for the public are an integral consideration in compensating the increased costs borne by the public, which are incurred by the execution of exclusive rights.

or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.”).

²⁵ See Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 1007 (1997) (“The only clear way to avoid infringing on a patent is to use a product that was in the prior art—an approach which does not capture any of the value of the patented invention.”).

²⁶ See Lemley, *Point of Novelty*, *supra* note 22, at 1274-75.

²⁷ See Alan L. Durham, *Patent Symmetry*, 87 B.U.L. REV. 969, 971 (2007) (“The architect of a unified system would be tempted to re-imagine equivalence, if equivalence there must be, as a symmetrical manifestation of the obviousness principle. In other words, looking backwards in time from the date of the invention, what the applicant has added to the prior art must be nonobvious in order to be patentable; looking forward in time, what the accused infringer adds to the claimed invention must be nonobvious in order to avoid infringement.”). See also Amy L. Landers, *Patent Claim Apportionment, Patentee Injury, and Sequential Invention*, 19 GEO. MASON L. REV. 471, 475-78 (2012) (Professor Landers compared the invention with related prior art to determine the adequate scope of damages under patent law.).

*D. Patent Infringement and After-arising Technologies**1. Impact of After-arising Technologies on Literal Infringement*

The elements of a claim are not always static, especially when they are drafted in an abstract manner to describe a device or component that has an expected function.²⁸ Although the claim construction of literal infringement should be fixed at the date of the patent application, the comparison of all elements of the accused product and a claim is inevitably vulnerable to the perception of a PHOSITA at the date of patent infringement.²⁹ In particular, the claim construction may entitle the patentee to include specific elements in the scope of exclusive rights, which are formed by the technologies not recognized when the patent application was initially filed. In other words, even if all elements of an accused product or process are read into a claim for the determination of literal infringement, partial elements of the product or process are the results of new technologies developed after the date of patent application. As mentioned above, under patent law, scholars usually recognize such new technologies as after-arising technologies. For example, when a personal storage device serves as an element in a claim and is expected to cover a floppy disk at the date of patent application, it is possible for the patentee to read a USB flash drive into a claim as a personal storage device at the date of literal infringement, provided that the infringer practiced the claim to include an accused product as having a flash drive as an element. In order to carry through on the public notice of a patent, the golden

²⁸ See Dank L. Burk and Mark Lemley, *Quantum Patent Mechanics*, 9 LEWIS & CLARK L. REV. 29, 32-33 (2005). Currently, American scholars of patent law have been concerned about the functional claiming of software-related inventions would be against the policy of patent law to encourage technological improvement or cumulated innovation. See, e.g., Lemley, Mark A., *Software Patents and the Return of Functional Claiming* (October 12, 2012). Stanford Public Law Working Paper No. 2117302. Available at SSRN: <http://ssrn.com/abstract=2117302> or <http://dx.doi.org/10.2139/ssrn.2117302>; Kevin Emerson Collins, *Patent Law's Functionality Malfunction and the Problem of Overbroad, Functional Software Patents*, 90 WASH. U. L. REV. 1399 (2013).

²⁹ See Kevin Emerson Collins, *The Reach of Literal Claim Scope into After-Arising Technology*, *supra* note 5, at 497.

rule is the determination of literal infringement should be set at the date of patent application. However, patent law never teaches the public how to define the boundary of the aforesaid public notice such that even third parties take advantage of new technologies that are unforeseeable at the date of patent application. Through the comparison of all elements, literal infringement seems unavoidable to practice the claim.³⁰ In addition, patent law, any doctrine case law, or established judicial decisions did not lead us to exemption from the literal infringement of after-arising technologies. Even worse, we are never instructed by patent law to distinguish literal infringement involving after-arising technologies from those just committed through technologies that are known when the patent application was filed. That is why more than one academic observation of the interaction between the literal infringement and after-arising technologies concluded that the time allowed for the determination of literal infringement has substantially been set at the date of patent infringement.³¹ Because the author emphasizes the requirement of non-obviousness under patent law, it is worth noting that, while the requirement of non-obviousness ensures more excellent inventive quality than prior art does to qualify an invention as a patent, the scope of exclusive rights enjoyed by the patentee should not be beyond the contribution of the inventive quality confirmed by non-obviousness. Meaning that in terms of literal infringement, the interpretation of a claim seems limited by the contribution of the inventive quality of a patent, compared with prior art. It is difficult to imagine that patent law would entitle a patentee to the exclusive rights to an infi-

³⁰ See *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247 (Fed. Cir. 2004); *Super-Guide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 896 (Fed. Cir. 2004)(Judge Michel concurring) (“Construing ‘regularly received television signal,’ ‘radio frequency information,’ and ‘mixer’ in the ‘578 patent, the majority holds that these terms encompass receiving and processing digital signals not transmitted by television broadcasters at the time the patent issued. As in the majority opinion, I treat these three terms together because they present the common issue of whether digital signals fall within the literal scope of the claim; that is because the latter two terms involve downstream processing of the ‘regularly received television signal.’”).

³¹ See Mark A. Lemley, *The Changing Meaning of Patent Claim Terms*, 104 MICH. L. REV. 101, 103 (2005).

nite extent, even subsuming the technologies beyond the original contribution of a patent into a claim that the exclusive rights are always secure against unauthorized practices. Consequently, the exquisite symmetry between the inventive quality and the exclusive rights bolstering the justification of claim construction would collapse, owing to the interference of after-rising technologies with the determination of literal infringement.

2. *Impact of After-arising Technologies on Doctrine of Equivalents*

In fact, the issue of after-arising technologies also confronts the application of DOE. According to patent law, DOE is applied to provide equitable remedy to the insufficiency of the assertion of literal infringement when third parties merely made an insubstantial change to elements of a claim in order to escape the comparison of all elements of an accused product or process and a claim.³² Based upon fair protection for the patentee, DOE is allowed to function beyond the limitation of a claim to evaluate an accused product or process derived from a claim through insubstantial changes as a patent infringement, thus paralleling the literal infringement. In other words, on the condition that the accused product or process, compared with the claim, run (1) substantially the same way (2) in order to approach substantially the same result, (3) under substantially the same function, the accused product or process will be caught by DOE as a patent infringement.³³ Moreover, besides the aforesaid tripartite test, the known interchangeability, being evaluated from the technological difference between the accused product or process and a claim, may lead to the determination of patent infringement under DOE, provided that the interchangeability can prove insubstantial changes of the claim

³² In the development of traditional U.S. patent law, fairness has been among the most significant concerns in establishing the doctrine of equivalents. See *Graver Tank v. Linde Air Prods. Co.*, 339 U.S. 605, 607-608 (1950); Michael J. Meurer & Graig Allen Nard, *The Doctrine of Equivalents: Invention, Refinement and Patent Claim Scope: A New Perspective on the Doctrine of Equivalents*, 93 GEO. L.J. 1947, 1960-67 (2005).

³³ See *Graver Tank & Mfg. Co. v. Linde Air Products Co.*, 339 U.S. 605, 608-10 (1950).

made by the accuser.³⁴ It is noted that the application of DOE under patent law is subject to the time of patent infringement, other than the date of patent application instructing the determination of literal infringement. In the author's observation, a possible reason for preferring the time of patent infringement under DOE is that case law or the development of judicial cases in various jurisdictions places much emphasis on preventing unscrupulous copyists from merely exploiting the patent without any substantial contribution to the patent improvement or re-innovation, but by making a minor technical adjustment to a claim to exempt from literal infringement. Consequently, the most persuasive reason why DOE is applied on the time basis of infringement seems to favor fairness to the patentee, instead of, under case law, adding an exceptional rule into the original public notice policy of a patent focusing upon the date of patent application. For example, U.S. patent case law recently reiterated that DOE is never intended to expand the claim scope of a patent, but takes advantage of exclusive rights to achieve the goal of fairness under patent law.³⁵

However, even if the application of DOE never contradicts the jurisprudence of claim construction and merely achieves a necessary equitable result of fairness, it cannot be denied that the exclusive rights under patent law, enhanced by the mechanism of DOE, may easily bring after-arising technologies into the scope of a claim, as the claim construction under literal infringement may do. According to case law or the development of judicial cases, it is found that DOE application faces more exceptions than the determination of literal infringement does. The author's analysis of the exceptions of DOE yielded three possible aspects of jurisprudence behind case law and the development of judicial cases. One possible direction of thought is to reserve sufficient room for cumulated innovation. This thought represents the establishment of an all-element doctrine serving as an exception to DOE. The all-element doctrine exempts third parties from patent infringement

³⁴ See *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*, 520 U.S. 17, 36, 39-40 (1997).

³⁵ See *Wilson Sporting Goods Co. v. David Geoffrey & Assocs.*, 904 F.2d 677, 684 (Fed. Cir. 1990).

under DOE, as long as they could develop any element not included in a claim of the patent.³⁶

The second possible direction of thought concerns the trust of the public in disclosing the idea of the claim drafter, on the behalf of the patentee, about a claim, or its specification, that forms the original boundary of a patent, or any adjustment to a claim during patent prosecution. To secure the former trust against the distortion of public notice, the exception of “public dedication” is recognized under patent law.³⁷ If a patentee selected to disclose the examples of a specific element in the specification, instead of including them directly in a claim, and these examples should have been included in the aforesaid claim for the interpretation of the aforesaid specific element, DOE will not be allowed to incorporate the alternative interpretation of a specific element of a claim in the specification into claim construction. To clarify, when third parties substituted an alternative for a specific element in a claim, and this substitution was not disclosed in the claim but in the specification, the patentee was deprived of any allowance to apply DOE to find the accused product or process infringement. Another DOE exception, in connection with trust in public notice, is “prosecution history estoppels.”³⁸ Under this exception, if the patentee amended a claim of the patent to ensure patentability during the patent prosecution, the scope of exclusive rights will be limited to the amended claim, even though the patentee seeks the application of DOE, unless the element corresponding to an amended element had been unforeseeable at the date of patent application.³⁹ Consequently, it may be observed that in prosecution history, estoppels have assumed the trust of the public upon the patentee’s decision regarding the amendment of a claim for patentability that produces a notice of the scope of the exclusive rights, and has fixed the application of

³⁶ *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. at 28-30. The European states seem to either put less emphasis on this rule or question fundamentally the necessity of the all-element requirement on DOE. See *Beloit Technologies, Inc. v. Valmet Paper Machinery, Inc.*, [1995] P.R.C. 705 (U.K.); Stenvik, *supra* note 15, at 17.

³⁷ See *Johnson & Johnston Assocs., Inc. v. R.E. Service Co.*, 285 F.3d 1046 (Fed. Cir. 2002).

³⁸ *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. at 30-34.

³⁹ See *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 740-41 (2002).

DOE into the amended claim inasmuch as DOE will not be involved with unforeseeable elements corresponding to the amended element.

The third possible direction of thought tends to protect prior art from the exploitation of the patentee through the application of DOE. It is called the defense of prior art.⁴⁰ The justification for this defense is that if prior art has established an existing order the public relied upon to develop technologies or existing benefits the public enjoyed, or is enjoying, in the public domain, this status should not be broken because of functions of the patent law system. Alternatively, if DOE is applied to cover, instead of distinguish from, prior art in the exclusive rights, it would contravene the gist of patent law by encouraging the continuous innovation of industries.

E. Reasonable Allowance of After-Arising Technologies

According to traditional exceptions, case law or judicial cases tend to remedy the possible distortion to the function of public notice of a claim and the inappropriate expansion of exclusive rights over prior art resulting from the application of DOE. However, it seems difficult to find any idea delivered or hinted at by case law or judicial cases made under the continental legal system to deal with the issue of after-arising technologies connected with patent infringement, and to determine the broadest capacity of a claim allowed to contain after-arising technologies through asserting literal infringement and applying DOE. In order to avoid a loose allowance of after-arising technologies, which would frustrate the cumulative innovation of technologies, academics are much more concerned about how to establish a specific approach to resolving the problem of inadequate enrichment for the patentee caused by after-arising technologies.

⁴⁰ Wilson Sporting Goods Co v. David Geoffrey & Assocs., 904 F.2d at 684-85.

1. *The Approach of Narrow Claim Construction under Literal Infringement*

Theoretically, a couple of possible approaches to mitigate the negative effects caused by after-arising technologies were introduced to the determination of literal infringement and application of DOE. One possible way to deal with the issue of after-arising technologies is to narrowly interpret against any ambiguous terms of a claim, and then leave the reasonable scope of a claim to be decided by DOE.⁴¹ This line of thought seems to express a meaningful indication that DOE is better fitted to assume after-arising technologies are against patent infringement than the determination of literal infringement is. Since the ambiguous terms of a claim are vulnerable to the discretion of claim construction, narrowing the interpretation of a claim, to the extent that the status of technology in such interpretation would comply with that at the patent application date, is considered effective in protecting a claim from being enriched by after-arising technologies. Simultaneously, this thought also relies greatly upon DOE to correspond appropriately to after-arising technologies. Perhaps the most possible ground for this stand might be recognized as the result of following the inherent characteristic of DOE, which is legally exposed to after-arising technologies according to the date of patent infringement.

However, it seems neither the tripartite test nor the insubstantiality test would work to evaluate the reasonable allowance of after-arising technologies in the scope of exclusive right against patent infringement. Instead of the evaluation of after-arising technologies, the application of DOE always concentrates on the fairness of patent protection. From this point, DOE is never inherently designed to resolve a dispute about after-arising technologies under patent infringement. As a matter of fact, according to U.S. patent case law, the application of DOE is not even capable of discerning whether the technologies covered by DOE as patent infringement were foreseeable at the patent application date. Although the defendant raised the defense of prosecution history

⁴¹ Lemley, *The Changing Meaning of Patent Claim Terms*, *supra* note 31, at 119-21.

estoppels against the application of DOE, the Supreme Court found a way for the patentee to overcome the defense, provided that the patentee would prove the unforeseeability of specific alternatives over amended elements of a claim at the patent application date.⁴² In other words, the effects of prosecution history estoppels possibly led to the result that the patentee merely constrained the application of DOE to the literal scope of the amended claim. However, the court thought that the patentee should not completely bear the rigid legal effects of the application of DOE to bar the coverage from unforeseeable corresponding elements. A special exception was eventually fixed to assuage the defense of prosecution history estoppels so that the patentee could still assert the DOE to protect unforeseeable technologies. From this point, even though the jurisprudence existing behind the aforesaid unforeseeability test works to refine the application of DOE, it should be

⁴² *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. at 740-41. In this case, for the purpose of patentability, the plaintiff own two patents for an improved magnetic rodless cylinder. While the inventions under the first patent (the Carroll patent) has been amended during the patent application by adding the new limitation so that the inventions contain a pair of sealing rings, the second patent (the Stoll patent) has also been amended to have the sleeve made of a magnetizable material. After the two patents concerned were granted, the defendant sold the infringing cylinders, which have a single sealing ring and their sleeves were made of nonmagnetizable alloy. Notwithstanding the application of the doctrine of equivalents, the Federal Circuit *en banc* held that the prosecution history estoppel keeps the patentee from asserting the patent infringement on the ground that the patents concerned have ever amended to secure the patentability. However, the Supreme Court adopted a flexible way to interpret the prosecution history estoppel, and found the exceptions for such the estoppel.

The Supreme Court addressed the concept of unforeseeability:

There are some cases, however, where the amendment cannot reasonably be viewed as surrendering a particular equivalent. The equivalent may have been unforeseeable at the time of the application; the rationale underlying the amendment may bear no more than a tangential relation to the equivalent in question; or there may be some other reason suggesting that the patentee could not reasonably be expected to have described the insubstantial substitute in question. In those cases the patentee can overcome the presumption that prosecution history estoppel bars a finding of equivalence.

recognized that DOE never automatically functions to implement any mission of interest refinement pursued by unforeseeable technologies. Under patent law, unforeseeability is possibly among the factors that are considered when evaluating the significance of after-arising technologies in the determination of patent infringement.⁴³ As we mentioned above, since the DOE fails to deal with the issue of unforeseeable technologies, it is hard to anticipate that it would consummate the interest consideration about the reasonable allowance of after-arising technologies when a patent is infringed.

2. *The Approach of Revised Peripheral Concept*

The second direction of thought stems from the fundamental review of the patent law system regarding claim construction. Under the peripheral system, the uncertainty of claim interpretation, as well as the designed extension of exclusive rights through the DOE, is susceptible to the arbitrary interference of after-arising technologies without adequate means to check the justification of such technologies. The growth of a claim from the patent application date seems inevitable according to the practical experience of claim construction. In shifting to the central system, the core of an invention should be established for public notice in the scope of the patent's exclusive rights. In this system, the realistic boundary of a patent is determined by the court's assessment of the reasonable development of the inventive core at the time patent infringement occurred.⁴⁴

Theoretically, there is no distinction between literal infringement and equivalent infringement. Based on the recognition of the core of an invention and its reasonable expansion to build up the patent scope, claim construction may work against the patent infringement that was determined by either literal infringement or DOE under the peripheral system.⁴⁵ Perhaps focusing on the specific characteristic of the inventive core to establish the patent

⁴³ See Kevin Emerson Collins, *Enabling After-Arising Technology*, 34 IOWA J. CORP. L. 1083, 1089-1105 (2009).

⁴⁴ See Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1746-47 (2009).

⁴⁵ *Id.* at 1772-73.

scope under the central system, the issue of after-arising technologies would not be seriously taken. However, the same issue is expected to arise when the reasonable expansion of a claim is desired to decide what acts constituted patent infringement. It should be admitted that when theoretically compared with the mechanical application of DOE for the pursuit of fair protection, the central system finds more room for the court to build up the reasonable scope of exclusive rights through interest consideration, inclusive of after-arising technologies. In practice, it is still worth exploring through further observation whether the issue of after-arising technologies is necessarily the concern of claim construction under the central system. Proposing any adjustment over the peripheral system with reference to the jurisprudence of the central system is undoubtedly conducive to the enhancement of the function of public notice over the patent scope, and the justification for claim construction.⁴⁶ However, the issue of after-arising technologies, as well as its delicate consideration of interest seems to have an uncertain status, even though the court could seize the opportunity to deal with the issue under the model of claim construction in the central system.

3. *The Approach of Refined Claim Construction on “thing” and “meaning”*

A paradox occurs when the fixation of the literal scope of a patent at the time of the application date in theory collides with the growth of the scope at the infringement date in reality. A thought was proposed to settle such paradox by refining claim construction regarding “thing” and “meaning.”⁴⁷ In terms of patented products

⁴⁶ *Id.* at 1780-83. See also Jeanne C. Fromer, Claiming Intellectual Property, 76 U. CHI. L. REV. 719, 772-74, 775-76 (2009) (“The cognitive science literature and common sense also demonstrate that the choice of claiming by characteristic or by exemplar might affect content notice and assessment of protectability. After abstracting away the interpretive rules that have developed for current patent claiming, the choice of claiming system does not, in and of itself, affect the breadth of the set of protected embodiments but for its sometimes deleterious effect on the protection of developments incorporating after-developed technologies.”).

⁴⁷ Kevin Emerson Collins, *The Reach of Literal Claim Scope into After-Arising Technology*, *supra* note 5, at 513-14.

with reference to a corresponding claim, the intrinsic properties may be found to distinguish themselves from other kinds of products.⁴⁸ In other words, the intrinsic properties constitute the essential feature of patented products.⁴⁹ Any and all other properties are classified as extrinsic properties. Instead of substituting for intrinsic properties, extrinsic properties merely serve to supplement some materials or components in order to strengthen the function or structure of patented products.⁵⁰

With regard to meaning, patented products may be defined as either “denotational meaning” or “ideational meaning.”⁵¹ The former works to stand for such products in the world, whereas the latter is helpful to distinguish such products from the same kind of things by specifying them with expression.⁵² Based upon the division of “thing” and “meaning”, a possible way to resolve the disputes of after-arising technologies under patent law is to provide different treatments of claim construction. Because the intrinsic properties of patented products express core characteristics of these products, it is best to hold these patents’ interpretation in the claim according to the technological status of the patent application date.⁵³ Relatively, the claim interpretation of extrinsic properties, in order to supplement intrinsic properties, seems to also make it allowable to consider after-arising technologies to determine patent infringement.⁵⁴ As to the interpretation of a claim’s meaning, a similar model may be used to keep the status of denotational meaning of patented products at the application date, and to give the ideational meaning a flexible interpretation regarding after-arising technologies.⁵⁵

Although the division of “thing” and “meaning” establishes a new perspective for probing into the reasonable allowance of after-arising technologies under claim construction, it seems doubtful

⁴⁸ *Id.* at 521-23.

⁴⁹ *Id.* at 523-25.

⁵⁰ *Id.* at 521-23.

⁵¹ *Id.* at 537-38.

⁵² Kevin Emerson Collins, *The Reach of Literal Claim Scope into After-Arising Technology*, *supra* note 5, at 539-42.

⁵³ *Id.* at 530-33.

⁵⁴ *Id.* at 533-36.

⁵⁵ *Id.* at 545-48.

whether the grounds for the division always follows the jurisprudence of patent law that instructs the claim construction to determine adequate scope of the exclusive rights. Literal infringement is admitted under patent law to secure the patentee's domination over the practice of claims pursuant to the status of public notice of such claims that stand by the filing date of a patent. Simultaneously, when any coverage, coming within the exercise of exclusive rights through claim construction, excessively contravenes the public notice of a patent, the determination of literal infringement should be seriously scrutinized to insure no unjust enrichment would be made to the patentee, or if an unbearable cost would be shouldered by the public, especially regarding potential inventors of technological improvement or cumulative innovation.

This article focuses on the issue of after-arising technologies, which possibly develop against the public notice of a patent and to unfairly favor the patentee. However, instead of being divided by resorting to exclusive interest consideration and evaluation under patent law, the recognition of the intrinsic and extrinsic properties of patented products originally comes from ordinary people's observation without any clear indication of claim construction. The intrinsic properties may be used to present some essential characteristics of the patented product. Although these characteristics serve to distinguish the patented product from other things, they are not necessary to function from the evaluation of a PHOSITA under patent law. In other words, the essential characteristics of patented products are not equivalent to the core of a claim reflected in patented products that would be evaluated by a PHOSITA, compared with prior art. Consequently, it is worth questioning whether using after-arising technologies to practice a claim and to materialize intrinsic properties would result in opportunities where the patentee might take advantage of literal infringement to assert a broader scope of a patent than that tolerated by the core of a claim. Theoretically, it is possible that applying after-arising technologies to the intrinsic properties of patented products for asserting literal infringement is still justified by the perception of a PHOSITA because the determination of such literal infringement never influences the evaluation of the core of a claim. According to a similar argument, the phenomena ought not to be ignored where the extrinsic properties augmented by the after-arising tech-

nologies bring about a metamorphosis in the core of a claim, and the right to remedy the literal infringement under this situation would make the patentee's exclusive rights go beyond the boundary of a claim. It seems problematic to rely heavily upon the division of "thing" to give adequate interest consideration between claim construction and after-arising technologies under patent law. The division of "thing" sometimes is vulnerable to the risk of deviation from the evaluation of a PHOSITA on a claim.

Since the division of "meaning" is observed from the angle of linguistics, not a PHOSITA's perception, the dispute of after-arising technologies arguably would make claim constriction through such division run into a predicament similar to that incurred by the division of "thing." Even though the division of "thing" and "meaning" better induces the settlement of after-arising technologies under claim construction, it seems difficult to prevent the same issue from occurring in the application of DOE. On one hand, DOE is inherently designed to function at the technological status of patent infringement. On the other hand, under the paramount jurisprudence of fair protection instructing the DOE, there is little room for other interest consideration made by the division of "thing" and "meaning" to work with the gist of fair protection under the DOE. Eventually, the division of "thing" and "meaning" in the DOE is not helpful in dealing with the issue of after-arising technologies.

4. *The Approach of Analogous Enablement*

Patent law's enablement requirement could also serve as leverage to deal with the issue of after-arising technologies on either application of the DOE or determination of literal infringement.⁵⁶ It is well known that the original function of enablement is to secure the public's access to a patent by referring to specification without undue experimentation.⁵⁷ In particular, at the expiration of

⁵⁶ See Kevin Emerson Collins, *Enabling After-Arising Technology*, supra note 43, at 1093-94; Timothy R. Holbrook, *Equivalency and Patent Law's Possession Paradox*, 23 HARV. J. LAW & TEC 1, 40-43 (2009).

⁵⁷ 35 U.S.C. § 112(a): "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to

a patent, the requirement of enablement is compatible with the gist of patent law, which prevents exclusive rights from substantially dominating the public domain where the expired patent is located. Were it not for the mandatory enablement of a patent's specification, some patentees might take advantage of insufficient disclosure in the specification to keep information necessary for the practice of the patent exclusive. In this situation, due to an inventor's poor disclosure of patent information, even though the expired patent entered the public domain, the patentee is the only one capable of successfully practicing such patent with reasonable transaction costs.

Secrecy of patent information is tantamount to an illegal extension of the term of a patent.⁵⁸ Consequently, the granting of a patent is justified merely on the condition that the patentee fulfilled its obligation to disclose sufficient information for patent practice at the date of patent application. Insofar as the contributions of the patentee to her patent enablement, the possession of the patent is affirmed under patent law.⁵⁹ The scope of possession

which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention"; Article 83 of the European Patent Convention: The European patent application shall disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art; *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1998); *HACON & PAGENBERG*, *supra* note 21, at 100-01.

⁵⁸ See JANICE M. MUELLER, *PATENT LAW* 124 (4th ed. 2013).

⁵⁹ As a matter of fact, the controversial issue happens if the written description is separate from the enablement as an independent requirement of patentability under the same authority of section 112 (1) of the U.S. Patent Act. U.S. case law seems to support the independence of written description and addresses the function of written description is to delimit the scope of claims possessed by the patentee through sufficient disclosure. The academic literature questions this position and thinks that the function of written description is inherent in the requirement of enablement under patent law. On the development of U.S. case law in this issue, please see *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336 (Fed. Cir. 2010); *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559 (Fed. Cir. 1997). On the reflection from academic criticism, please see Martina I. Schuster, *Sufficient Disclosure in Europe, Is There a Separate Written Description Doctrine under European Patent Convention?* 76 *UMKC L. REV.* 491, 502-04 (2007); Dennis Crouch, *An Empirical Study of the Role of the Written Description Requirement in Patent Examination*, 104 *NW. U. L. REV. COLLOQUY* 382, 385-87 (2010).

entitles the patentee to assert the exclusive rights against patent infringement.⁶⁰

Based upon the possession of patent concept, it seems the requirement of enablement under patent law could be used to detect the reasonable allowance of after-arising technologies as a defense against patent infringement. In other words, when patent infringement is made by third parties through the uses of after-arising technologies, either as literal infringement or as the application of the DOE, the accused product or process would be hypothetically regarded as a claim of infringed patent. Furthermore, it should be observed if such claim were practiced by a PHOSITA without undue experimentation pursuant to the specification of the infringed patent.⁶¹ The resulting affirmative answer indicates that the aforesaid after-arising technologies are within legal possession of the patentee.⁶² Therefore, it is reasonably allowed that the patentee invoke patent infringement to bring those after-arising technologies into the scope of exclusive rights. This is the test of enablement. Following the example mentioned above, it is assumed the infringer used Element X5 with Elements Y and Z to manufacture and sell the patented product that is claimed a combination of Elements X, Y and Z as Claim 1 under Patent A, without the patentee's authorization. There are two simultaneous preconditions for this scenario. According to the aforesaid fact, manufacture and sale without the patentee's consent constituted patent infringement by either the determination of literal infringement or the application of the DOE. In addition, compared with Element X, Element X5 is within the definition of after-arising technologies under this article.

⁶⁰ *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d at 1360 (Judge Newman's additional views : "The practical utility on which commercial value is based is the realm of the patent grant; and in securing this exclusionary right, the patentee is obliged to describe and to enable subject matter commensurate with the scope of the exclusionary right.").

⁶¹ See Collins, *Enabling After-Arising Technology*, *supra* note 43, at 1084 ("The enablement doctrines restricts the scope of an inventor's claim so that it remains commensurate with the contribution to technological progress that the inventor has disclosed in her specification.").

⁶² Professor Collins also analyzed three possible models for adopting the enablement concept to evaluate if the after-arising technologies might be included in the scope of exclusive rights, respectively, "The Foreseeability Rule," "The Identity Rule" and "The Complementarity Rule." *Id.* at 1083-85.

The enablement test is expected to probe into whether the specification of Claim 1 under Patent A would enable the infringing product that comprises Elements X5, Y and Z. If a PHOSITA could refer to the specification to manufacture the infringing product without undue experimentation, it might be inferred the patentee is justified in covering the infringing product in claim construction or equivalent extension of Claim 1 by asserting patent infringement. It is arguable the concept of possession under the test of enablement sets a possible justification under patent law to probe into a reasonable allowance of after-arising technologies under patent infringement. However, the test is still worth reviewing.

Ordinarily, the enablement requirement is assumed under the capability of the patentee of providing sufficient disclosure on the specification. It is the patentee's obligation to prove its possession over the invention that is attributable to the subject matter of a patent. Any failure to sufficiently disclose in order to enable a PHOSITA to practice the patented invention with undue experimentation, either because of a lack of due diligence of the patentee or the patentee's other marketing considerations, would deprive the patentee from possessing such invention, through the rejection of the patent application, the revocation of the granted patent according to the system of public reviews, or the defenses of patent invalidity for patent infringement.⁶³

The real meaning of the aforesaid obligation under patent law is to impose the enablement requirement upon the patentee. And the disadvantages would be delivered to the patentee provided that the patentee did not satisfy this requirement but should have done so according to the expectation of patent law. Nonetheless, after-arising technologies occur after the patent application date and are not always predictable at the time when the patentee drafted the claims and the specification for patent application. Compared with the fulfillment of the patent's enablement for the patent application

⁶³ U.S. patent law has enacted an opposing system against the granting of a patent in 2011, which is named as "Post-Grant Review." See 35 U.S.C. §§ 321-29 (2011). The petition of post-grant review may be raised within nine months after the grant of a patent. Another mechanism, named "Inter Partes Review" serves a similar function, but stands a position for supplement of post-grant review. Any petition should be raised after nine months from the grant of a patent. See 35 U.S.C. §§ 311-19 (2011). Cf Articles 99-105c and 138 of the European Patent Convention.

to possess the patented invention, it seems quite distinctive to analogize the concept of possession to determine the reasonable allowance of after-arising technologies in assertion of patent infringement. It is not anticipated to request the patentee cross a time gap to enable after-arising technologies by the specification set up at the date of patent application. Simultaneously, it lacks a justified ground for the patentee to possess unpredictable after-arising technologies merely through the satisfaction of enablement requirement under which the status of technological development was fixed at the date of patent application. If the concept of possession through the analogous application of the enablement requirement is used to determine the allowance of after-arising technologies, it is tantamount to following a speculative way to decide the fate of patent infringement without a justified solid foundation.

Moreover, even though the concept of possession is suitable as an objective approach to deal with the issue of after-arising technologies under patent infringement, the test of enablement, with reference to the specification, works poorly to detect the types of after-arising technologies that overcompensate patentees disproportionally to the contribution of the original patent to the public. Therefore, it is possible some after-arising technologies were proven to be possessed by the patentee, but such possession would fail to secure a balance between the scope of exclusive rights and the technological contributions a patent is anticipated by patent law legislators to convey. Under this phenomenon, the imbalance of interest considerations seems harmful to the gist of patent law promoting cumulative innovation.

5. The Approach of Analogous Non-obviousness

As argued above, in terms of the non-obviousness requirement under patent law, exclusive rights are justified by the excellence of the inventive quality a patent established, when compared with prior art. By the same token, we have to admit that any inventive quality produced by after-arising technologies, which is more excellent than an original invention and is endowed inherently, never comes within the scope of patent claims, either through the assertion of literal infringement or the application of the DOE. Otherwise, opportunities to substantially improve or refine the

original invention under a patent would be hindered. However, following the aforesaid observation, the patentee may enjoy any inventive quality beyond the original granting scope of the patent caused by after-arising technologies merely by relying upon the mechanical application of claim interpretation and the DOE.

Instead of focusing upon the patent disclosure to ensure the legal possession of a patent, the non-obviousness requirement indeed functions to distinguish the inventive quality in order to set up a reasonable boundary of qualitative superiority, when comparing a patent with prior art. Correspondingly, the reasonable scope of exclusive rights also will follow such a boundary to meet the legislative purpose of patent law. Consequently, the non-obviousness requirement is qualified as a legal lever to deal with the issues of after-arising technologies and to discover the reasonable allowance of those technologies under the determination of patent infringement. The author believes that to analogize the non-obviousness requirement to patent infringement would be conducive to resolving disputes regarding the uses of after-arising technologies to practice claims by the accuser.

i. The Structure of Analogous Non-obviousness

To specify the idea of *mutatis mutandis* in the non-obviousness requirement, the author proposes a test model in which a defense may be raised against the patent infringement on condition that the accuser took advantage of after-arising technologies to practice a claim or claims. The defense is related to the non-obviousness requirement, but it did not serve as a mechanism to invalidate the infringed patent. Its sole function is to adjust the adequate scope of a claim initiated by the assertion of literal infringement or the application of the DOE after screening the after-arising technologies the accuser used as part of infringement. In fact, from the point of view of comparative law under various jurisdictions, this approach should not be unfamiliar in the determination of patent infringement. The U.S. case, *Wilson Sporting Goods Co. v. David Geoffrey & Associates*, adopted a similar con-

cept of non-obviousness to prevent prior art from the interference of exclusive rights under the DOE.⁶⁴

Under the model proposed by the author, the test, which is similar to that of the *Wilson Sporting Goods Co.* case, is grounded on a hypothetical base. First, the precondition for the test is that the practice of a patent claim for the accused product or process constitutes infringement through either claim interpretation or the application of the DOE. Second, the aforesaid claim practice should be built upon the fact that the accuser took advantage of after-arising technologies to facilitate the patent infringement. The hypothetical claim is then formed by reference to the accused product or process. By raising the defense against patent infringement under this circumstance, where after-arising technologies are involved, the accuser may request the court regard the infringed patent as being among prior art over the hypothetical claim mentioned above. If sufficient evidence brought by the accuser in front of the court is capable of proving the lack of non-obviousness, based on the evaluation of a PHOSITA, at the time of infringement, it would represent that the accused product or process was incarnated with more excellent inventive quality than that of the infringed patent. Pursuant to the justification established on the balance of the scope of exclusive rights and technological contribution made by a patent, the patentee is not allowed to cover any inventive quality not contributed by the patent. From this angle, the defense against patent infringement should be affirmed to empty the assertion of literal infringement or the application of the DOE.

In this situation, after-arising technologies are not within the reasonable allowance under patent law and should be reserved for future potential inventors to apply for patents. In the following example of my proposal, it is assumed that Claim 1 of Patent A is composed of Element X1, Element Y, and Element Z. The infringer manufactured infringing products by taking advantage of Element X6, Element Y, and Element Z to practice Claim 1. In other words, the infringing products were categorized into three elements, respectively Element X6, Element Y, and Element Z. In addition, we also assume that the patentee's exclusive right to

⁶⁴ *Wilson Sporting Goods Co v. David Geoffrey & Assocs.*, 904 F.2d at 684-85.

make was violated by the manufacture of infringing products because Element X6 was either read into the literal scope of Element X1 or evaluated as an insubstantial change to Claim 1 by corresponding to Element X6 under the DOE. The condition needs be set up so that Element X6 is among the after-arising technologies. That is to say, Element X6 is not available until after the date of patent application.

According to the author's proposal and based on the hypothetical facts mentioned above, if the patentee took legal action against the infringer by arguing for the patent infringement on Claim 1 of Patent A, through either the determination of literal infringement or the application of the DOE, it is the infringer's burden to prove that Element X6 is an after-arising technology. Only when the infringer proves the after-arising technology did not cause any further dispute would it be the infringer's option to defend the patent infringement by challenging the justification of claim construction on the after-arising technology.

My proposal creates a hypothetical test of non-obviousness for such a defense. In my scenario, compared with the traditional evaluation of non-obviousness regarding the requirement of patentability, a hypothetical non-obviousness test functions according to three steps. The first step is to identify the invention as the subject matter of the test. This step seems easily simplified in the traditional evaluation of the requirement of non-obviousness to satisfy patentability, but it presents a significant meaning in the hypothetical test for constraining the after-arising technologies to a reasonable extent under claim construction. To achieve the goal of checks on reasonable allowance of the after-arising technology, it is surely necessary to consider the infringing products as patented ones. Meaning, by abstracting tangible products to intangible ideas, the idea to manufacture infringing products or execute infringing process will be the hypothetical invention claimed in an invention. In this scenario of infringing products, the infringer practicing Element X6 with other elements serves as an assumption to equate the idea to manufacture the infringing product with the hypothetical claim.

The second step is designed to establish the scope of the prior art of an invention claimed in a patent. Instead of the date of patent

application, the hypothetical non-obviousness test takes the *date of patent infringement* as the basis of prior art. Except for the difference in the time point used to measure prior art, the hypothetical non-obviousness test and the traditional requirement of non-obviousness have shared a common track to delimit prior art. Under the traditional requirement of obviousness, the concept of “analogous art” under the U.S. system or the concept of “closest art” under the E.U. system is often used to determine the availability of prior art through pragmatic means.⁶⁵ The hypothetical non-obviousness test surely follows either “analogous art” or “closest art” to pursue its designed function.

For example, under the concept of analogous art, it is necessary to ascertain the technologies that are within the same field as the aforesaid hypothetical claim, or are reasonably pertinent to particular problems the aforesaid hypothetical claim is assumed to involve, but a distinctive field from the hypothetical claim. Such technologies may be collected as prior art to the hypothetical claim at the date of patent infringement. In practice, Claim 1 should not be ignored and should reach the scope of prior art for the hypothetical claim. The final step in the hypothetical non-obviousness test is to rely upon a PHOSITA to evaluate whether the difference between the hypothetical claim and its prior art is obvious to a PHOSITA, as the traditional non-obviousness requirement did.

At this stage, regardless of whether the U.S. model or European model is followed, the level of the art skill owned by a PHOSITA is determined. Additionally, under this situation, the teaching, suggestion, and motivation launched by prior art to induce the hypothetical claim also would be accurately concerned. As soon as such causation is established in the view of a PHOSITA, the non-obviousness requirement typically has a negative evaluation. The causation may be read similarly with the teaching suggestion and motivation (TSM) test, the concept of

⁶⁵ See *In re Clay*, 966 F.2d 656, 658-59 (Fed. Cir. 1992) (“Two criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor’s endeavor, whether the reference is still reasonably pertinent to the particular problem with which the inventor is involved.” See also *In re Klein*, 647 F.3d 1343 (Fed. Cir. 2011); *K-Tec, Inc. v. Vita-Mix Corp.*, 2012 U.S. App. LEXIS 18773 (Fed. Cir. Sept. 6, 2012). See also *HACON & PAGENBERG*, *supra* note 21, at 54.

“obvious to try,” the doctrine of “teaching away” and even the consideration of secondary factors, which have all been developed by US case law.⁶⁶

ii. The Application of Analogous Non-obviousness

When the aforesaid three steps for the evaluation of non-obviousness under the hypothetical non-obviousness test are completed, if the result shows that the hypothetical claim cannot satisfy the requirement of non-obviousness in the hypothetical status, the conclusion is the infringer took advantage of Element X6, Element Y, and Element Z to have the infringement composed of Element X1, Element Y and Element Z in terms of technological qualitative excellence. As addressed above, the requirement of non-obviousness under patent law serves as a core benchmark to fix a reasonable technological status beyond prior art to justify any as-

⁶⁶ On the TSM test, a popular approach adopted in the U.S. court of Appeal for the Federal Circuit to evaluate the non-obviousness requirement, please see ROBERT L. HARMON, PATENTS AND THE FEDERAL CIRCUIT 227-36 (9th ed. 2009). On the concept of “obvious to try,” please see *In re O’Farrell*, 853 F.2d 894, 902-903 (Fed. Cir. 1998) (“In some cases, what would have been ‘obvious to try’ would have been to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful...In others, what was ‘obvious to try’ was to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it.”) (“Obviousness does not require absolute predictability of success. Indeed, for many inventions that seem quite obvious, there is no absolute predictability of success until the invention is reduced to practice. There is always at least a possibility of unexpected results, that would then provide an objective basis for showing that the invention, although apparently obvious, was in law nonobvious.”) On the doctrine of “teaching away,” please see ROBERT L. HARMON, PATENTS AND THE FEDERAL CIRCUIT 205-07 (9th ed. 2009). As to secondary considerations for the non-obviousness requirement, please see *Graham v. John Deere Co.*, 383 U.S. 1, 16-17 (1966) (“Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or non-obviousness, these inquiries may have relevancy.”).

section of patent infringement in the future. Even though Element X6 is among the after-arising technologies, compared with Claim 1, this never changes the technological status beyond prior art endowed by a patent in which the patentee subsumes Element X6 into the scope of exclusive rights through claim construction or the DOE. Neither should it be minded that extending Claim 1 to cover Element X6 risks hindering the public from using such element to do technological improvements or further innovations. Consequently, the defense of after-arising technologies cannot be sustained in this situation, and the use of Element X6 to manufacture infringing products still constitutes patent infringement through either claim construction or the DOE.

When the result of the hypothetical non-obviousness test indicates the opposite of the aforesaid situation, the hypothetical claim is evaluated as non-obvious under patent law. The incorporation of Element X6 into Claim 1 through asserting literal infringement or applying the DOE seems to cause metamorphosis of the original technological status beyond prior art. The enrichment caused by Element X6 should be left for further innovations and patent applications. Importantly, the enrichment by Element X6 would not be solely occupied by the patentee in accordance with the gist of patent law. In this situation, it is adequate for the court to hold that the defense of after-arising technologies is successfully made against the assertion of patent infringement. Although the infringer might be exempted by the defense of after-arising technologies, this does not necessarily mean that the infringer gains the domination of Element X6 combined with Elements Y and Z by the decision. It should be clarified that the manufacture of infringing products is still exposed to the development of other inventions, especially those products conceived and filed application for a patent after the application of Patent A.

The determination of literal infringement through claim construction and the application of the DOE is deeply rooted in various jurisdictions of patent law. The two types of patent infringement are also strongly justified because they fulfill the patentee's obligation to the public trust by providing notification of exclusive right and a policy of fair protection. Clearly, the defense of after-arising technologies seems to challenge the original justification of assertion of patent infringement. No matter how significant the de-

fense of after-arising technologies is in securing the essence of patent law and policy, it is undeniable that the determination of patent infringement, even if done mechanically, deserves a prima facie on the appropriateness of technological status the patentee enjoys for both parties concerned. It is the infringer's burden to raise sufficient evidence to assist the court in the evaluation of non-obviousness under the hypothetical non-obviousness test. Any failure to provide factual proof in connection with the hypothetical non-obviousness test will cause the infringer to bear the stringent effects of patent infringement.

III. CONCLUDING REMARKS AND PRACTICAL PROPOSAL

Claim construction, without doubt, is a game of words. In order to ascertain the satisfaction of the patentability requirement and evaluate patent infringement, the interpretation of a claim with its related specification always serves as highly significance to a PHOSITA. In line with this thought, a sound patent law system is secured by a justified claim construction that reasonably leads to the most adequate results in grants of patents and assertions of exclusive rights. However, it is worth observing that the relevancy of the difference between the requirements of patentability and the scope of exclusive rights has been received minimal notice in various jurisdictions of patent law.

This article showed that the novelty and non-obviousness requirements, are, in fact, endowed with an implicit indication of the reasonable extent to which the patentee could exercise the exclusive right against the public through claim construction and even the application of the DOE. This article argues that only within the scope of any technological contribution that is more highly excellent than prior art under a claim, the patentee may be entitled to implementing the exclusive rights to seek remedies for patent infringement. From this angle, the requirement of non-obviousness could be applied as a lever to detect a reasonable claim interpretation on the determination of literal infringement and the application of the DOE. This article also proposes this lever could also be used to deal with the issue of after-arising technologies.

The issue of after-arising technologies has been lurking in the system of patent law because of inherent characteristics of the system. The determination of literal infringement is established in accordance with the technological status of the patent application. Claim construction was made to grasp the inventor's real intention of the patent, which is recognized by a PHOSITA at the date of patent application. However, it seems no promised mechanism exists to distinguish the reasonable allowance of after-arising technologies when claim construction was made to determine whether patent infringement exists or not. The DOE is also vulnerable to the risk of ignoring the development of after-arising technologies, determined by the three-tripartite test or the insubstantial test. The purpose of fair protection for the DOE often preempts the recognition of reality in the development of after-arising technologies. Furthermore, the time of application of the DOE at the date of patent infringement is misconceived to suppose that all after-arising technologies are tolerable under the DOE. It may be observed that the defense of prior art against the application of the DOE is affirmed in various jurisdictions. However, the concept of protecting specific after-arising technologies from interference by the DOE has not been formed in case law or judicial cases, even though such technologies are highly connected to the possibility of technological improvement or cumulative innovations, which concern the legislators of patent law.

Moreover, the issue of after-arising technologies has not drawn sufficient attention with regard to emerging economies. One possible reason for this phenomenon is that they are shadowed by the aforesaid systematic defects that hinder insight into the issue of after-arising technologies on claim construction or the application of the DOE. Another possible reason may be the fact that the high rate of invalidating granted patents because of concerns of patent quality in the court would lead those jurisdictions to distract from the issue that would be among the defenses against patent infringement. However, this does not mean the issue of after-arising technologies is indifferent in emerging economies. When patent quality is gradually improved to a reasonable level by learning from the lessons experienced in the jurisdictions of the U.S. and E.U., one focus on achieving a sound patent law system is un-

doubtedly attributed to the evaluation of after-arising technologies in the determination of patent infringement.

In order to seek an optimal model to deal with the issue of after-arising technologies under patent infringement, some academics have proposed solutions to detect the reasonable allowance of after-arising technologies in claim construction or the application of the DOE. In the author's opinion, all alternatives proposed for the issue of after-arising technologies share a common feature, by which approaches other than technological evaluation were used to distinguish the kinds of after-arising technologies that may be within the scope of exclusive rights from those that may not. While the parameters of "thing" and "meaning" focus on the characteristics of patented products, either structurally or linguistically, the test of enablement extends the capability of the original specification to infringing products containing after-arising technologies to ascertain whether they are matched.

As the author observed, the jurisprudence of the non-obviousness requirement of patentability is an enlightening link between the determination of patent infringement and the advantage of technological excellence enjoyed by a claim over prior art. It is arguably inferred that the patentee is not entitled to including the technologies used in patent infringement into the scope of exclusive rights, provided that such technologies belong to the advantages beyond prior art. In particular, the article transposes the concept of non-obviousness by evaluating the technological advantages to check the reasonable allowance of after-arising technologies in the determination of patent infringement. The case of *Wilson Sporting Goods Co.* under U.S. patent case law was presented as a hypothetical test of non-obviousness to determine whether the defense of prior art against application of the DOE works. This article uses the concept of non-obviousness to apply *mutatis mutandis* to the patent infringement made by the after-arising technologies, by the establishment of a hypothetical test that is similar to the test in *Wilson Sporting Goods Co.*

It is admitted that the test of non-obviousness for the after-arising technologies runs into the same predicament of uncertainty as the traditional test does for the non-obviousness requirement for patentability. In addition, to set up the scope of relevant prior art and provide evidence to evaluate the causation of prior art over the

patent also possibly frustrates the infringer's incentive to bring a defense against the coverage of after-arising technologies in a claim. However, the author believes that the test to filter the reasonable allowance of after-arising technologies for patent infringement stands firm in complying with the gist of patent law, the ultimate goal of which is to promote technological progress by creating sustainable room for cumulative innovations. The proposed model is workable because it links tightly to the concept of non-obviousness. As an exception to the exercise of exclusive rights, the test of non-obviousness should not interfere with or preempt the determination of a patent by either claim construction or the application of DOE. Therefore, the author proposes that the determination of patent infringement would constitute a *prima facie* of the appropriateness of the technological status for availability of the patentee's exclusive rights. Nevertheless, it is the infringer's option, as well as burden, to bring a defense derived from the test of non-obviousness against the presumed patent infringement.

